

needle but also serves to capture fluid that might exude from the needle point.

The arrow adjacent the enclosed needle point cap 110 in FIG. 4 indicates the direction the enclosed needle point cap 110 is rotated in preparation for attachment of the needle point guard safety cap assembly 100 to the syringe. Rotation of the base cup 150 and the enclosed needle point cap 110 allows the needle to pass through both of them in preparation for attachment of the needle point guard safety cap assembly 100 to the syringe.

FIG. 5 depicts the needle point guard safety cap assembly 100 attached to the syringe 190 in preparation for receiving a needle sheath 300. Although in the presently preferred embodiment it is attached to the needle hub 204, it is also possible to attach it to syringe barrel 202.

As shown in FIG. 5, the collapsible extension 130 is beginning to collapse as the needle point guard safety cap assembly is installed in preparation for application of needle sheath 300. FIG. 5 also shows how one of the clips 148 will ultimately extend between the arms 134 of the wishbone segment 132 when the collapsible extension 130 is collapsed.

FIG. 6 shows the extension 130 collapsed or folded with one of the clips 148 extending between the arms 134 of the wishbone segment 132. Both of the clips 148, as is evident from FIG. 6 will extend between the arms 134 of the wishbone segment 132 when the collapsible extension 130 is folded.

FIG. 5 also depicts the base cup 150 protrusion 192 and the slot 194 in the collapsible extension prior to needle sheath 300 application. The arms of the wishbone segment 132 allow the protrusion 192 to engage the slot 194.

As is evident from FIG. 6 the needle point cap 110 is adapted to receive the needle sheath 300 to protect the needle from contaminants prior to use. In the presently preferred embodiment, the enclosing member or top wall 118 abuts the bottom wall 154 of the base cup 150 to prevent needle contamination. The syringe with the needle point guard safety cap assembly 100 and the needle sheath 300 installed as depicted in FIG. 6, is as the user would receive it prior to use. To use the syringe, the user simply removes the needle sheath and proceeds to use the syringe in the normal manner depicted by FIG. 7. The protrusion 192 on the attachment member and slot 194 in the collapsible extension keep the needle point cap 110 from sliding down the needle shaft while the needle sheath 300 is being removed.

Subsequent to use, the user simply urges the folded collapsible extension 130 with his finger to dislodge the enlarged head of protrusion 192 from the slot 194. The passage of the enlarged head of the protrusion through the slot provides tactile feedback to the user that the needle shield has actuated; also, in applying sufficient pressure to force the head through the slot, it is assured that the user's finger has sufficient momentum to fully actuate the needle shield.

The user then continues to urge the collapsible extension 130 to cause the needle point cap 110 to slide the length of the needle as shown in FIG. 8. In the presently preferred embodiment, as the needle point cap 110 nears the needle point, the pressure platform 146 nears and ultimately contacts the lever arm 120. After contact, further urging of the collapsible extension 130 causes a force to be applied to the lever arm 120. Approximately coincident with contact, the needle point clears the hole 114 and becomes located within the chamber 128. After the needle point has cleared the hole

114 the needle point cap 110 rotates about hole 122, and hence about the needle point in response to urging of the lever arm 120. FIG. 9 shows the rotated needle point cap 110.

As collapsible extension 130 approaches the needle shaft in response to the urging of the user, the clips 148 engage or surround the needle so that the collapsible extension 130 is clipped in place as shown in FIG. 9. This provides a means to maintain or secure the rotated position of the needle point cap 110 with respect to the needle point by maintaining engagement of the pressure platform 146 with the lever arm 120 so as to prevent the needle point from re-emerging through the hole 114. It also serves to provide a means to keep the collapsible extension 130 from folding and allowing the needle point cap 110 to slide back up the needle shaft thereby exposing the needle point. Therefore, the clips 148 provide a means for securing the needle point cover 110 in the needle-protective position. The clips also provide additional tactile feedback to the user as they engage the needle shaft.

In addition, in the presently preferred embodiment depicted in FIG. 9, the well chamber 126 serves to capture the needle point and prevent it from re-emerging through the hole 114. The well chamber also helps to capture fluid that might exude from the needle point so that it can not easily escape from the needle point cap. Furthermore, in preparation for disposal, needle sheath 300 can be placed over the needle point cap 110 for convenience and to ensure the capture of any excess fluid which might leak from the hole 114 in the bottom wall 116 of the needle point cap 110.

While only several embodiments of the invention have been described, numerous modifications or other embodiments could be made without deviating from the invention thus described in the following claims.

What is claimed is:

1. A needle point guard safety cap assembly for securely covering and protecting the needle point of a syringe after the syringe has been used, comprising:

- a) a syringe attachment member operable to firmly attach the needle point guard safety cap assembly to the needle hub of a syringe;
- b) a needle point cover member in the form of an elongated hollow member that is open at one end for receiving the needle therein, and at its other end is mostly enclosed by an end wall having a hole through which the needle can pass;
- c) a lid adapted to close the otherwise open end of the cover member, the lid also having a hole through which the needle may pass so that the needle may extend through both holes;
- d) an extensible frame having a proximal end and a distal end, the proximal end coupled to the syringe attachment member and the distal end coupled to the needle point cover; the extensible frame being manually actuable for advancing the cover member along the needle to where the end wall of the cover member is beyond the extremity of the needle point;
- e) the needle point cover member then being supported by the hole in the lid and then, in response to further advancement of the cover member, rotating about the lid hole until the needle point passes inside the enclosed end wall of the cover member into a protected position where it cannot pass through the cover member hole.

2. A needle point guard safety cap assembly as in claim 1 wherein the lid is pivotally secured to the cover member; and the syringe attachment member, cover member, lid, and extensible frame are integrally formed of plastic material.

3. A needle point guard safety cap assembly as in claim 1, wherein the cover member further comprises a well chamber formed in the end wall adjacent to the hole for passage of the needle therein, the well chamber being operable for enclosing the sharp end of the needle once the needle point cover has been actuated, thereby preventing the sharp end of the needle from re-emerging through the hole.

4. A needle point guard safety cap assembly as in claim 3 further comprising a fulcrum on the needle point cover, with the extensible frame being further operable to act on the fulcrum when the end wall of the cover member is beyond the extremity of the needle point and thereby cause the cover member to rotate such that the sharp end of the needle enters the well chamber.

5. A needle point guard safety cap assembly as in claim 1, wherein the extensible frame further comprises a proximal frame segment and a distal frame segment, the frame segments coupled in the center of the extensible frame with a hinge, the hinge being in a closed position prior to actuation of the needle point cover with the proximal and distal frame segments lying substantially parallel to one another, with extension of the frame being achieved by opening the hinge.

6. A needle point guard safety cap assembly as in claim 5, further comprising at least one securing clip on the extensible frame, the securing clip being operable to irreversibly engage the needle when the needle point cover is fully actuated.

7. A needle point guard safety cap assembly as in claim 1, further comprising interlocking members on the syringe attachment member and the extensible frame, the interlocking members releasably securing the needle point guard safety cap assembly in its un-actuated state and providing a tactile indication when the needle point guard safety cap assembly is actuated.

8. A needle point guard safety cap assembly as in claim 7, wherein the interlocking member on the syringe attachment member comprises a protrusion having a bulbous enlarged end, and the interlocking member on the extensible frame comprises a slot of a width slightly less than the diameter of the bulbous end; the protrusion and slot being positioned on the syringe attachment member and extensible frame, respectively, such that when the needle point guard safety cap assembly is in its unactuated state with the needle point cover member most distal from the needle point the protrusion engages the slot with the bulbous end of the protrusion passing through the slot, whereby the needle shield is releasably maintained in its unactuated state.

9. A needle point guard safety cap assembly as in claim 1, wherein the syringe attachment member further comprises at least one annular slot to engage a corresponding annular ring on the needle hub of a syringe.

10. A needle point guard safety cap assembly as in claim 1, wherein the syringe attachment member further comprises at least one longitudinal slot to engage a corresponding longitudinal ridge on the needle hub of a syringe to maintain a fixed radial orientation of the needle point guard safety cap with respect to the cannula opening of the syringe.

11. A needle point guard safety cap assembly as in claim 1, wherein the needle point cover member is adapted to receive a needle sheath, thereby allowing the needle sheath to cover the needle when the needle point cover member is distal from the needle point.

12. In a needle point guard safety cap assembly having (1) a syringe attachment member operable to connect the needle point guard safety cap assembly to the needle hub of a syringe; (2) a needle point cover operable to enclose the needle tip when the needle point guard safety cap is actuated; and (3) an extensible frame having proximal and distal ends, the proximal end coupled to the syringe attachment member and the distal end coupled to the needle point cover, interlocking members on the syringe attachment member and extensible frame operable to releasably lock the needle point guard safety cap assembly in an unactuated state and to provide tactile feedback to the user when the needle point guard safety cap assembly actuation is initiated.

13. In a needle point guard safety cap assembly having (1) a syringe attachment member operable to connect the needle point guard safety cap assembly to the needle hub of a syringe; (2) a needle point cover operable to enclose the needle tip when the needle point guard safety cap is actuated; and (3) an extensible frame having proximal and distal ends, the proximal end coupled to the syringe attachment member and the distal end coupled to the needle point cover, at least one securing clip on the extensible frame to engage the needle shaft upon activation of the needle point guard safety cap assembly to prevent the needle tip from exiting the needle point cover and to provide tactile feedback to the user when the needle point guard safety cap assembly actuation is completed.

14. In a needle point guard safety cap assembly having (1) a syringe attachment member operable to connect the needle point guard safety cap assembly to the needle hub of a syringe; (2) a needle point cover operable to enclose the needle tip when the needle point guard safety cap is actuated; and (3) an extensible frame having proximal and distal ends, the proximal end coupled to the syringe attachment member and the distal end coupled to the needle point cover: (a) an inner chamber within the needle point cover operable to contain the needle tip when the needle point guard safety cap assembly is actuated, and a needle entry hole and needle exit hole in communication with the inner chamber, the syringe needle passing through the entry hole, inner chamber, and exit hole prior to actuation of the needle point cover, and then withdrawing from the exit hole upon actuation such that the needle tip is within the inner chamber;

(b) a fulcrum integral with the needle point cover and which upon actuation of the needle point guard safety cap assembly contacts the shaft of the needle, the fulcrum operable to cause the needle point cover to rotate with respect to the needle shaft;

(c) a lever arm also integral with the needle point cover, the lever arm operable to apply rotational force to the needle point cover; and

(d) a pressure platform integral with the extensible frame, the pressure platform operable to apply pressure to the lever arm when the needle point guard safety cap assembly is actuated and the syringe needle tip is within the inner chamber, causing the needle point cover to rotate such that needle tip cannot re-emerge from needle point cover through the exit hole.

15. A needle point guard safety cap assembly for securely covering and protecting the needle point of a syringe after the syringe has been used, comprising:

a) means for firmly attaching the needle point guard safety cap assembly to the needle hub of a syringe;

b) a needle point cover in the form of an elongated hollow member that is open at one end for receiving the needle therein, and at its other end is mostly enclosed by an end wall having a hole through which the needle can pass;

c) means for enclosing the otherwise open end of the cover member, but permitting a needle to pass through;

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d) frame means coupled to the syringe attachment means and the distal the needle point cover means; the frame means being manually actuable for advancing the cover member along the needle to where the end wall of the cover member is beyond the extremity of the needle point;

e) the cover member then being supported by the hole in the lid and, as it advances, rotating about the lid hole until the needle point passes inside the enclosed end wall of the cover member into a protected position where it cannot pass through the cover member hole;

f) the needle point guard safety cap assembly being integrally formed.

16. A needle point guard safety cap assembly as in claim 15 further comprising manually actuated locking means for securing the cover member in the needle-protective position.

17. A needle point guard safety cap assembly as in claim 15 further comprising a means for releasably locking the cover in a position distal from the point.

18. A needle point guard safety cap assembly comprising:

- a) a base cup comprising:
  - (i) a circumferential wall with a bottom wall attached thereto for defining a cup,
  - (ii) the cup being adapted to attach to a syringe,
  - (iii) the bottom wall of the cup having a hole therethrough to allow passage of a needle,
  - (iv) a pair of attachment arms extending outward from the circumferential wall near the base cup bottom wall, and
  - (v) a locking protrusion extending from the circumferential wall near the base cup bottom wall;
- b) a collapsible segmented extension having at least two segments comprising:
  - (i) a wishbone segment having two arms and a base, the arms being flexibly attached to the base cup attachment arms such that the base cup can rotate about the axis formed by the attachment arms to wishbone connection; and
  - (ii) a lower segment having upper and lower ends, the upper end being flexibly attached to the wishbone base, the lower segment having a locking slot near the lower end for releasably locking the lower segment to the base cup locking protrusion when the segmented extension is collapsed and the lower segment is in a position adjacent the base cup; and

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- c) a needle point cap flexibly connected to lower end of the lower segment, the needle point cap comprising:
  - (i) a circumferential wall, a top wall, and a bottom wall which define a chamber; and
  - (ii) the top wall and the bottom wall of the needle point cap each containing a bore therethrough to allow passage of the needle.

19. In a needle point guard safety cap assembly having a syringe attachment member and an extensible frame coupled to the syringe attachment member,

- a needle point cover coupled to the extensible frame, the needle point cover having the form of an elongated hollow member having a first end and a second end;
- a lid member coupled to the needle point cover and closing the first end, the lid member having a hole formed therein for receiving the needle;

the needle point cover second end being mostly enclosed by an end wall having a hole through which the needle can be extended for use, the end wall further having a well chamber to engage and retain the sharp end of the needle when the needle is retracted.

20. The needle point cover of claim 19, further comprising a fulcrum member which may be acted upon by the extensible frame of the needle point safety cap assembly when the end wall of the cover member is beyond the extremity of the needle point, thereby causing the cover member to rotate such that the sharp end of the needle enters the well.

21. The needle point guard safety cap assembly of claim 12, further comprising at least one securing clip on the extensible frame to engage the needle shaft upon activation of the needle point guard safety cap assembly to prevent the needle tip from exiting the needle point cover.

the interlocking members and securing clip further serving to provide tactile feedback to the user when the needle point guard safety cap assembly actuation is initiated and completed, respectively.

22. The needle point guard safety cap assembly of claim 13, further comprising interlocking members on the syringe attachment member and extensible frame operable to releasably lock the needle point guard safety cap assembly in an unactuated state, the interlocking members and securing clip further serving to provide tactile feedback to the user when the needle point guard safety cap assembly actuation is initiated and completed, respectively.

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